Physico-chemical properties of soil of village pond of Chandrahatti, District Muzaffarpur (Bihar)

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Abstract

In present study a complete view of the soil quality of pond have been analyzed for fish farming. This is a perennial pond. It has been found that the bed of pond almost neutral to alkaline throughout the year 2012. The findings revealed a marked correlation between soil and production of fish.

Keywords : Physico-chemical, Parameters, Pond, Quality, Soil.

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INTRODUCTION

Soil contains a variety of elements, chemical components and minerals, Calcium, Magnesium, Potassium, Phosphorus, Hydrogen, Oxygen, Nitrogen, Carbon, Zinc, Sulphur, Manganese, Iron, Aluminum, Boron, Copper, Silicon, Sodium and Chloride, which are found in soil of North Bihar. According to Hoon (1958), these elements are never found in the soil in Free State but combine with other elements to focus compounds, such as Nitrogen as Nitrate and Phosphorus as Phosphate. Physico-chemical parameters of soil play a vital role in fish farming. Soil constituents are directly related to the growth of aquatic animals and plants but these constituents are being greatly affected by the physico-chemical parameters. Hence, imposing a negative bearing on productivity. In India, different investigators studied soil condition and ecological parameters of water bodies. In the northern region of Bihar, the soil contains plenty of organic & inorganic compounds forming it more productive.

Due to these unstable conditions, a disorderly change in Physico-chemical parameters is always experienced. The place of our report is Chandrahatti a rural area under Muzaffarpur District of north Bihar where urbanization is spreading speedily. The area is low land comprising vast chawars suitable for paddy but is more prone to undesired water forcing the farmers to fish farming.

I have selected a pond of Chandrahatti for my study. Being a low land its Physico-chemical parameters are different from other places of North Bihar.

MATERIAL AND METHODS

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During the experiment, a soil sample was collected throughout the years (2012) on monthly intervals from January to December. The collected soil samples were mixed thoroughly and dried under shades. The air dried soil samples were analyzed for important chemical components using standard methods of Adoni A.D., *et.at,* 1985and APHA *et.at,* (1989).

RESULT AND DISCUSSION

The Physico-Chemical environment in the aquatic system influences survival and production of fish to a great extent. Among the most common parameters affecting the fish are temperature, dissolve oxygen, ph, carbon-dioxide, ammonia nitrate and hydrogen sulphate. The results of the present study are discussed below:

The range of variation of pH was 7.3 to 8.1 in 2012. Thus, the soil was alkaline throughout the period of investigation. The minimum value was 7.3 in January and maximum in May & December. Thus, there was gradual increase in pH value level due to increase rate of decomposing inorganic matter and conversion of CO_2 into Carbonic acid.

Organic carbon fluctuated between 0.70 to 1.85% during this year 2012. Maximum percentage of organic carbon was observes in July and minimum in January. The higher organic percentage in summer was due to rapid rate of decomposition at higher temperature. Lowest value in this year obtained in January might be due to low water temperature which depleted the decomposition to its minimum. In summer months decomposition process is higher so increase the percentage of organic carbon. Organic carbon of soil and dissolve oxygen of water showed in-

verse relationship.

The percentage of $CaCO_3$ is varying from 0.73 to 1.91. Thus, minimum percentage was recorded in July in summer which increased slowly to maximum in January. The insoluble calcium carbonate reacts with the carbonic acid to form soluble calcium bicarbonate explained high alkalinity status of the pond as water rich in alkalinity were rich in calcium.

Phosphate value of soil of the pond ranged from 0.44 to 1.41 ppm during this year. The highest value of phosphorus in October means in rainy season and lowest percentage of phosphate received in the month March i.e. in summer, is possibly due to the oxygen deficiency in pond water .The phosphate is released in the water from the soil, but during monsoon its value increases due to release of phosphate additionally from dead cells of algae, particularly diatoms. There is no definite co-relation was found between phosphate content of water and soil contrary to the observation of Ahmad (1996). Mode of distribution of phosphate was more or less in accordance with that of nitrogen which is similar to findings of Hajek, B.F. and C.E. Boyd, (1996) find ditoms as one of the main contributor of phosphate in the water body and in monsoon months phosphate from decomposition of algae might be the cause of increase of phosphate content in soil. In this way, the present observation is also support the findings of Bannerjee (1967). Nitrogen varied from 0.24 to 1.24 ppm in the month of June and September October. (Table) Thus, increase in total nitrogen contents of soil during monsoon may be attributed to the addition of nitrogenous compounds by leading of rain water from the

surrounding fields. The present pattern of variation is in accordance with the observation of Moitra and Bhowmick (1968) & Kumari Mamata (2007 & 2010).

Temperature plays important role in pond production. The temperature varies from season to season. It was maximum during the period of April to September. For proper growth of carps 16-38 0C range of temperature is essential.

The pH of soil ranged between7.0 to 8.0. During rainy & winter season pH of this pond become high. Diurnal variations in pH may be attributed to photosynthetic activities and consequent CO_2 balance in water.

D.O ranged between 4.3 and 7.1 ppm. It was observed that dissolved oxygen in water never a stress point. It is primary importance for respiration of all form of aquatic life, aerobic decomposition, precipitation of iron and manganese. DO of pond remains minimum during early morning hours and gradually increases to attain maximum value in the afternoon and decline thereafter during night.

CO_2 has also significance role in aquaculture. It is minor constituent of atmosphere highly soluble in water. Rain water contains nearly 0.6 ppm of dissolved CO_2. Photosynthesis activity also depends on the availability of CO_2 in the system.

The physico-chemical environment in the aquatic system influences survival and production of fish to a great extent. Among the most common parameters affecting the fish are temperature, dissolved oxygen, pH, carbon - di - oxide, ammonia nitrate and hydrogen sulphate.

The present finding is in close agreement with the finding of different Scientists.

The differences might be due to different climatic condition. It is a matter of further details investigation.

Table. Soil characteristics of pond

Parameter	Sampling seasons 2012											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
pH	7.3	7.4	7.6	7.8	8.1	7.9	7.4	7.5	7.7	7.9	8.0	8.1
Organic Carbon (%)	0.70	0.80	0.88	0.91	1.22	1.58	1.85	1.72	1.64	1.62	1.34	1.09
Calcium Carbonate (%)	1.91	1.78	1.34	1.19	0.90	0.70	0.88	1.03	1.60	1.60	1.76	1.82
Available Nitrogen (ppm)	0.82	1.00	0.70	0.55	0.38	0.24	0.85	0.08	1.24	1.24	1.12	1.05
Phosphorus (ppm)	1.16	0.86	0.78	0.59	0.44	0.50	0.45	0.72	1.30	1.41	1.14	1.12

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